

Serial No.: 10/081,655
Examiner: Shun K. Lee
Reply to Office Action of June 2, 2004

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Previously amended) An absorption spectroscopy apparatus having a fluid inlet and a fluid outlet and comprising:

a sample cell including an axis, a side wall having at least one curved reflective surface arrayed about the axis and facing inwardly with respect to the axis such that a beam of energy directed against a predetermined location on the reflective surface is reflected back and forth off the reflective surface and remains in substantially the same plane while inside the cell, and at least one port in the sidewall, and end walls closing ends of the side wall and having flat reflective surfaces facing inwardly with respect to the cell and lying in a plane extending substantially perpendicular to the axis of the cell, wherein the cell has a height measured in a direction parallel to the axis substantially equal to a source length and an energy path in the cell is substantially perpendicular to the cell axis; and

at least one source/detector reflector comprising a segment of a cylinder having a curved profile in a plane extending perpendicular to the axis of the cell, the reflector positioned with respect to the port of the cell to reflect energy through the port of the cell and against the predetermined location on the reflective surface of the side wall of the cell.

2. (Original) An absorption spectroscopy apparatus according to claim 1, wherein the reflective surface of the side wall of the cell has a circular profile in a plane extending perpendicular to the axis of the cell.

3. (Original) An absorption spectroscopy apparatus according to claim 1, wherein the reflective surface of the side wall of the cell has a flat profile in a plane extending parallel to the axis of the cell.

Serial No.: 10/081,655
Examiner: Shun K. Lee
Reply to Office Action of June 2, 2004

4. (Original) An absorption spectroscopy apparatus according to claim 1, wherein the port of the side wall of the cell comprises inlet and outlet ports, and the source/detector reflector comprises separate source and detector reflectors corresponding respectively to the inlet and the outlet ports.

5. (Original) An absorption spectroscopy apparatus according to claim 4, further comprising:

a source for directing energy against the source reflector; and

a detector for receiving energy from the detector reflector.

6. (Original) An absorption spectroscopy apparatus according to claim 1, further comprising an intermediate reflector positioned with respect to the port of the cell and the emitter/detector reflector to reflect energy from the emitter/detector reflector through the port of the cell and against the predetermined location on the reflective surface of the side wall of the cell.

7. (Previously canceled)

8. (Previously canceled)

9. (Previously amended) An absorption spectroscopy apparatus according to claim 1, wherein the reflective surfaces of the end walls are polished.

10. (Previously amended) An absorption spectroscopy apparatus according to claim 1, wherein the end walls are molded.

11. (Previously amended) An absorption spectroscopy apparatus according to claim 1, wherein the end walls include the fluid inlet and the fluid outlet of the apparatus.

12. (Original) An absorption spectroscopy apparatus according to claim 1, wherein the side wall is molded.

Serial No.: 10/081,655
Examiner: Shun K. Lee
Reply to Office Action of June 2, 2004

13. (Original) An absorption spectroscopy apparatus according to claim 1, wherein the reflective surface of the side wall is polished.

14. (Original) An absorption spectroscopy apparatus according to claim 1, further comprising a light transmissive window positioned within the port of the side wall.

15. (Previously canceled)

16. (Original) An absorption spectroscopy apparatus according to claim 1, further comprising:

a source for directing energy against the at least one source/detector reflector; and

a detector for receiving energy from the at least one source/detector reflector.

17. (Previously canceled)

18. (Original) An absorption spectroscopy apparatus according to claim 1, wherein the port of the side wall of the cell comprises a single inlet/outlet port, and the source/detector reflector comprises a single source/detector reflector, and the apparatus further comprises a source for directing energy against the source/detector reflector, and a detector for receiving energy from the source/detector reflector.

19. (Previously amended) An absorption spectroscopy apparatus according to claim 1, further comprising a source for directing energy against the at least one source/detector reflector, wherein the source provides infrared energy.

20. (Previously canceled)

21. (Original) An absorption spectroscopy apparatus according to claim 1, wherein the source/detector reflector is polished.

22. (Original) An absorption spectroscopy apparatus according to claim 1, wherein the source/detector reflector is molded.

Serial No.: 10/081,655
Examiner: Shun K. Lee
Reply to Office Action of June 2, 2004

23. (Previously amended) A sample cell for an absorption spectroscopy apparatus comprising:

a side wall having,

at least one curved reflective surface facing inwardly with respect to an axis of the sample cell such that a beam of energy directed against a predetermined location on the reflective surface is reflected back and forth off the reflective surface and inside the sample cell, and

at least one port; and

end walls closing opposing ends of the side wall and having substantially flat reflective surfaces facing inwardly with respect to the cell and extending substantially normal with respect to the axis such that a beam of energy reflected back and forth off the reflective surface of the side wall and inside the sample cell remains in substantially the same plane while inside the cell, wherein the cell has a height measured in a direction parallel to the axis substantially equal to a source length.

24. (Previously presented) A sample cell according to claim 23, wherein the reflective surfaces of the end walls are polished.

25. (Previously presented) A sample cell according to claim 23, wherein the end walls are molded.

26. (Previously presented) A sample cell according to claim 23, wherein the reflective surface of the side wall is curved.

27. (Previously presented) A sample cell according to claim 23, wherein the reflective surface of the side wall has a circular profile in a plane extending parallel with the reflective surfaces of the end walls of the cell.

Serial No.: 10/081,655
Examiner: Shun K. Lee
Reply to Office Action of June 2, 2004

28. (Previously presented) A sample cell according to claim 23, wherein the reflective surface of the side wall has a flat profile in a plane extending parallel to the axis of the cell.

29. (Previously presented) A sample cell according to claim 23, wherein the side wall is molded.

30. (Previously presented) A sample cell according to claim 23, wherein the reflective surface of the side wall is polished.

31. (Previously presented) A sample cell according to claim 23, further comprising a light transmissive window positioned within the port of the side wall.

32. (Previously canceled)

33. (Previously presented) An absorption spectroscopy apparatus including a sample cell according to claim 23, and further comprising at least one source/detector reflector having a curved profile in a plane extending perpendicular to the axis of the sample cell, the reflector positioned with respect to the port of the side wall of the sample cell to reflect energy through the port and against the predetermined location on the reflective surface of the side wall.

34. (Previously presented) An absorption spectroscopy apparatus according to claim 33, wherein the port of the side wall of the sample cell comprises inlet and outlet ports, and the source/detector reflector comprises separate source and detector reflectors corresponding respectively to the inlet and the outlet ports.

35. (Previously presented) An absorption spectroscopy apparatus according to claim 34, further comprising:

a source for directing energy against the source reflector; and

a detector for receiving energy from the detector reflector.

Serial No.: 10/081,655
Examiner: Shun K. Lee
Reply to Office Action of June 2, 2004

36. (Previously presented) An absorption spectroscopy apparatus according to claim 33, further comprising an intermediate reflector positioned with respect to the port of the side wall of the sample cell and the emitter/detector reflector to reflect energy from the emitter/detector reflector through the port of the cell and against the predetermined location on the reflective surface of the side wall of the cell.

37. (Previously presented) An absorption spectroscopy apparatus according to claim 34, further comprising:

a source for directing energy against the at least one source/detector reflector; and

a detector for receiving energy from the at least one source/detector reflector.

38. (Previously presented) An absorption spectroscopy apparatus according to claim 34, wherein the port of the side wall of the cell comprises a single inlet/outlet port, and the source/detector reflector comprises a single source/detector reflector, and the apparatus further comprises a source for directing energy against the source/detector reflector, and a detector for receiving energy from the source/detector reflector.

39. (Previously presented) An absorption spectroscopy apparatus according to claim 34, further comprising a source for directing energy against the at least one source/detector reflector, wherein the source provides infrared energy.

40. (Previously presented) An absorption spectroscopy apparatus according to claim 34, wherein the source/detector reflector comprises a segment of a cylinder.

41. (Previously presented) An absorption spectroscopy apparatus according to claim 34, wherein the source/detector reflector is polished.

42. (Previously presented) An absorption spectroscopy apparatus according to claim 34, wherein the source/detector reflector is molded.

Serial No.: 10/081,655
Examiner: Shun K. Lee
Reply to Office Action of June 2, 2004

43. (Canceled) A sample cell according to claim 23, wherein a height of the cell defined between the end walls is relatively small compared to a width of the cell defined by the side wall.

44. (Canceled) A sample cell according to claim 43, wherein the width of the cell is at least twenty times greater than the height of the cell.